

Kinetics and Thermodynamics Studies on Removal of Methyl red dye by Green Synthesized Copper Oxide Nanoparticles (*Colocasia esculenta*)

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Abstract: *Nanoparticles are the spearheads of the rapidly expanding field of nanotechnology. Development of the green synthesis has gained environmental friendly protocol for synthesizing a wide range of metal and metal oxide nanoparticles. The present study is to undertake studies for Removal of Methyl red dye by Green Synthesized Copper Oxide Nanoparticles (*Colocasia esculenta*). The synthesized copper oxide nanoparticles were characterized by Ultraviolet Vis spectroscopy (UV-Vis), X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Energy Dispersive X-ray (EDX), and Dynamic Light Scattering (DLS). Adsorption parameters such as Initial dye concentration, Adsorbent dosage, pH, contact time, and Temperature were studied. Adsorption isotherm has been used to test the adsorption data (Langmuir, Freundlich, Temkin), Kinetics and thermodynamic factors were also calculated.. The adsorption kinetics shows good agreement of pseudo second order kinetic model. Moreover, the negative value of ΔG° reveals the spontaneous nature of the adsorption process and the negative value of ΔH° indicates the adsorption process exothermic and the positive values of ΔS° suggest increasing randomness of the adsorbent solution interface during the adsorption process of APT CuONPs. The green chemistry approach used in the present work for the synthesise of copper oxide nanoparticles is simple, cost effective, and good alternative method. The green synthesized copper oxide nanoparticles with high dye adsorption capacity might be a suitable option for dye removal from coloured aqueous solution. CuO nanoparticle prepared from above mentioned routes are expected to have more extensive applications such as Chemical sensor, Catalytic, Gas sensor, Semiconductor etc. This process is an economical method with respect to energy, time and its simplicity. Through this method a large scale of Green synthesized Copper Oxide Nanoparticles was produced.*

Keywords: Nanoparticles